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AT the monthly meeting of the Society of Gas Lighting, Thomas F. Rowland, Esq., was unanimously elected an honorary member of that organization. The Society, in thus gracefully placing Mr. Rowland on their honorary roll, reflect credit on themselves, as he is not only well known in this country, but also abroad; and, wherever known, is highly respected for his engineering skill, good business qualifications, and unsullied integrity.

THE GORDON GAS LAMP AND ITS SUCCESS AS A STREET LIGHTING DEVICE.

Some months ago we had occasion to call attention to a very successful exposition of street lighting by gas that was made in New York city under the auspices of the Siemens-Lungren Company. At the time referred to (April and May last) that Company had placed on Madison avenue, between Thirty-first and Thirty-third streets, 5 high-power street lamps of the Gordon type, each lamp being rated to consume 15 cubic feet of gas per hour, the estimated illuminating value obtained from that consumption being returned at something in excess of 250 candles. One of the reasons that caused this exposition was in the fact that some fault had developed in the arc lighting of the district, while another, and perhaps the leading reason, was that the Siemens-Lungren Company, with its usual aptitude for taking advantge of a condition that might better its commercial prosperity, desired to show the authorities that public lighting by gas, and completely successful lighting, too, was not only still within the range of possibilities, but was also available. While it was admitted both by the authorities and the public that the illumination of this portion of Madison avenue by means of the Gordon gas lamp left nothing to be desired, nevertheless the matter of adjusting and awarding the contracts for public lighting for the current year had then reached such a forward stage as to preclude the city from arranging for a portion of its lighting in accordance with the Madison avenue type of high-candle power gas service. The exposition, however, was not without good results; for apart from its having attracted the attention of the powers that be, the Company received several orders for the lamps from residents in the district. To show that the lamps have satisfied the requirements of these domestic users we have only to remark that the lamps so installed have not been discarded. This reward, although it was an indication that the value of the lamp as an illuminator for large spaces had been recognized, was hardly commensurate with what the Company seemingly had reason to expect. During the summer season—we think the lamps were withdrawn from Madison avenue early in June—the development was slow, although some progress in the favor of the lamp with ordinary users was constantly recorded. The vagaries of the electricians in their dealings with the Subway Board and in the performance of their public lighting contracts, however, came at last to positive disruption, and last month portions of the city were plunged in darkness.

Again, taking advantage of the situation, the Siemens-Lungren Company determined to show that not only could its exposition of the spring on Madison avenue be duplicated, but that it could be improved on, because of a nearer approach to perfection in the plan of construction and in the method of maintaining the Gordon type of lamp. Accordingly 49th and 50th streets, between Madison and Sixth avenues, were lighted under the Gordon plan, and with great success. In fact, so pronounced is the success of this latest experiment that the city authorities have ordered the installation of 75 Gordon lamps on a certain portion of Lenox avenue, which will give excellent opportunity for proof of the usefulness and value of this lamp as a street illuminator. The avenue is one of the few streets about which the metropolis may pride itself. Its good width and even surface (at the point where the installation is to be

made) are calculated to furnish opportunity to exhibit the service of the lamp at its best; and we have no doubt that the result will be apparent in the specifications under which Superintendent McCormick, of the Lighting Bureau, will call for bids for public lighting next year. It will be remembered that the rate of consumption of gas in the lamps shown last May on Madison avenue was 15 cubic feet per hour, and that the lighting value secured was, in round numbers, about 250 candles. Now, however, the lamps employed consume but 14 cubic feet per hour, while virtually the same illuminating service is obtained as when the consumption rate was on the higher plane. To the novice this gain may seem slight, but to the gas man who depends upon percentage for his knowledge of a gain or a loss, the advance will be appreciated at its true importance. In fact, if in the next six or even twelve months an advance of but one-half that scored since the Madison avenue experiment was reported transpires, the fraternity will be vastly more than satisfied. It is proposed to charge $60 per annum for each lamp of the Lenox avenue installation—the district so illuminated extends along the avenue north from 110th to 129th streets—and no mistake is made when it is said that three of the Gordon lamps will easily yield an illuminating service equal to that given by two of the arc lights for which the city pays at the rate of $127.75 each per annum. Of course, it is understood that this lighting is to be carried out on the basis of the New York city schedule which calls for 4,000 hours of service each year. Even taking the electrician's estimate of 1,000 candles for each half arc (the sort now supplied in this city) maintained, the Gordon lamp will make a fair showing in the comparison; but when this estimate is cut down by photometric test to somewhere near the value of the illumination supplied, the three Gordon lamps will be found to make pretty close running to the two arcs which they *can* replace. If it is the province of the city authorities in their arrangements for the public lighting to make freer provision for the exterior illumination of the second and third floors of the buildings in front of which the arc lights are suspended, instead of attempting to illuminate the footways, why, arc lighting is the proper vehicle; but if the latter is to be the aim, the Gordon, or any other type of high gas power burner that may come in the future, would seem to have the call. Nor will the substitution be performed at the expense of economy; for it is not likely while electricians have to depend upon steam power for the actuation of their dynamos, that 4,000 hours of 1,000 candle power (nominal) lighting can be supplied at a much lower rate than the ruling one of $127.75.

Those in the business of supplying public electric lighting know full well that dynamos and lines are not spared in the matter of "loads," even if the nominal candle power does suffer thereby. With *every* "string pulled taut," it would seem as if arc lighting supply had about reached the limit in respect to economy of operation. Indeed, we have no hesitation in saying that a fully maintained half-arc light cannot be supplied at a profit in the Metropolis for 4,000 hours at the price at present paid. On the other hand, the success attained by the high power gas burner—of the Gordon type if you will, because that is the type that is successfully at work on our streets—seems to be in increasing ratio; and therein lies our expectation that gas, in our populous centers particularly, is to regain its supremacy as a medium for public illumination.

Gas makers should also bear in mind that the adoption by them of improved apparatus for street lighting means the use also of those high-candle power burners by shopkeepers for exterior lighting. Reason it out as you will, it is cost that in the long run determines the popularity of any given agent or factor in commerce. And if the storekeeper can see his way clear to saving $25 or $30 per annum in the modern method of maintaining a blaze of light in front of his premises, provided the service is equally satisfactory as between the cheaper and dearer method, it may be taken for granted that the economy is to win the day.

In connection with this development of the Gordon lamp in New York, due credit should be given to the Consolidated Gas Company, which has seemingly taken up the matter in earnest, and has ably seconded the Siemens-Lungren Company both in the preliminary expositions and the Lenox avenue installation.

The number of Gordon lamps now in use as public illuminators in this city are appended:

Location.	No. Lamps
Park avenue	4
Worth Monument	4
Forty-ninth and 50th streets, Sixth to Madison avenues	23
Lenox avenue, 110th st. to 129th st.	75
Total	106

In conclusion, we may note that the daily press of this city, never any too friendly in their expressions regarding gas makers and gas supply, are unanimous in praising the quality of the illumination afforded by the Gordon lamp. One statement (from the *Tribune*) is herewith reprinted:

"Reference has several times been made in these columns to the advantages possessed by a proper system of gas lamps for illuminating the streets. It is satisfactory to note that the plan in use in Madison avenue below Thirty-third street, to which attention was called, and also in Thirty-eighth street near Madison avenue, is now being tried in Forty-ninth and Fiftieth streets, between Madison and Sixth avenues. If you care to try you will find out two things that may surprise you. One is that you can see everything you want to see—that is, everything except the light itself—better by this inverted Argand gas light than by the brilliant, but dazzling, even blinding, electric light round the corner in Fifth avenue. This although the gas equals only about 100 candles" [should be 250 candles], "while the electric light ranges from twice to eight* times that power. Why? Because the highly-concentrated arc light is more powerful than the human eye can comfortably bear. On looking away from its direct rays one is struck by a momentary blindness, similar in cause and effect to snow-blindness. Second point: The inverted Argand on one corner throws no shadow until you are within about 20 or 30 feet of the old fishtail on the other corner, giving a nominal light of 15 candles. Now, why not test the question practically, as was done a few years ago in Holborn, London, by arranging with the electric light companies to illuminate one or more blocks on some prominent thoroughfare, where all may see the result, and then letting the gas companies do their level best on the adjoining block or two? We should then have a fair comparative test of candle power, cost and practical effectiveness of street lighting."

BRIEFLY TOLD.

THE WESTERN'S BADGES ARE READY.—Secretary Littleton advises us that the badges ordered by the Western Gas Association (for illustrated design of which see JOURNAL for June 10, 1889) are now ready for delivery. Members desiring these badges will have their request for same promptly honored by addressing the Secretary, at Quincy, Ills., the request to be accompanied by an inclosure of $3.25. The workmanship on the device is excellent.

A RATHER anomalous state of affairs is reported at Port Chester, N. Y., in respect to the public lighting of that place. Some time ago certain speculators visited the town in question, and, after the manner of that class, succeeded "in working up a healthy progressive sentiment" in favor of substituting electric lights for gas lights on the streets. In due time they got a contract, and the Port Chesterites eventually "basked" in the product of the substitution. Either from the poverty of the illumination, its excessive cost, or other good reason, a petition has been handed in to the Board of Trustees requesting them to cause the gas lamps to be relighted.

WE understand that a new bill virtually committing the city of St. Louis to the construction and operation of a municipal gas works has been submitted to the Municipal Assembly. We cannot perceive wherein it differs from the measure of a few months ago that was considered by the local authorities, and which in effect was simply a grant to certain parties under which "they or their assigns" were to be given the privilege of rifling the city treasury of a sum reaching into the millions. It is true that the new scheme does not deal with as many millions as did the older one; but the "joker" is there just the same.

AT a meeting of the Greensburg (Ind.) City Council, Mayor Dunn's vote (the division of the members resulted in a tie) decided in the affirmative a resolution to adopt the proposition submitted by the local Gas Company, under which the city is to take 40 arc lights for a term of 5 years. The rate agreed on is $80 per light per annum, a moon table to be followed.

MR. H. B. WEDGE, Supt. of the Montpelier (Vt.) Gas Company, was badly injured the other day while overseeing some repairs to the mains.

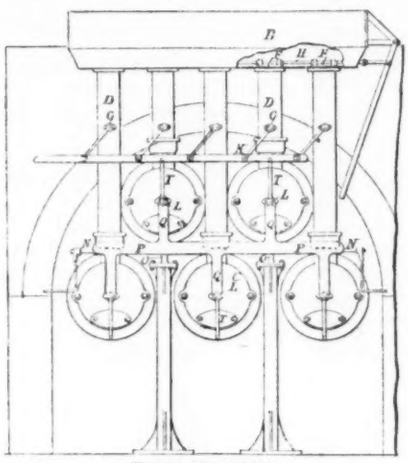
THE Directors of the Hackensack (N. J.) Gas Light Company have just issued a circular announcing an important concession in the matter of gas rates. Under the new scale the consumer of less than 2,000 cubic feet per month pays at the rate of $2.75 per 1,000, while those using larger quantities receive the advantage of a discount proportionate to the quantities consumed. Those taking over 10,000 cu. ft. get their supply at $2. The reduction is equivalent to a cut of 33 per cent. on the former rates.

* It will be noted that even the *Tribune* man looks upon the lighting value of the arc lamp in a very vague sort of way.

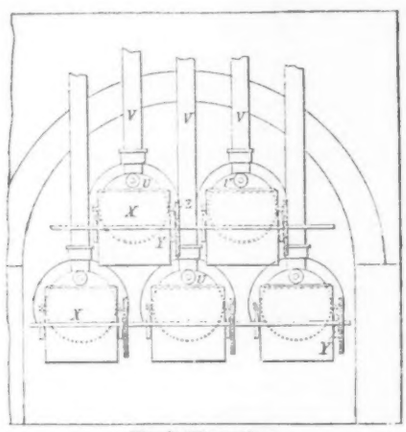
Elliott's Apparatus for the Continuous Carbonization of Coal.

The London *Journal*, having explained that its issue of July 16 last contained an abstract of the specification of the patent taken out in England by Mr. Jas. Elliott, Engineer and Manager of the Ludlow Gas Company, for the continuous carbonization of coal, goes on to say:

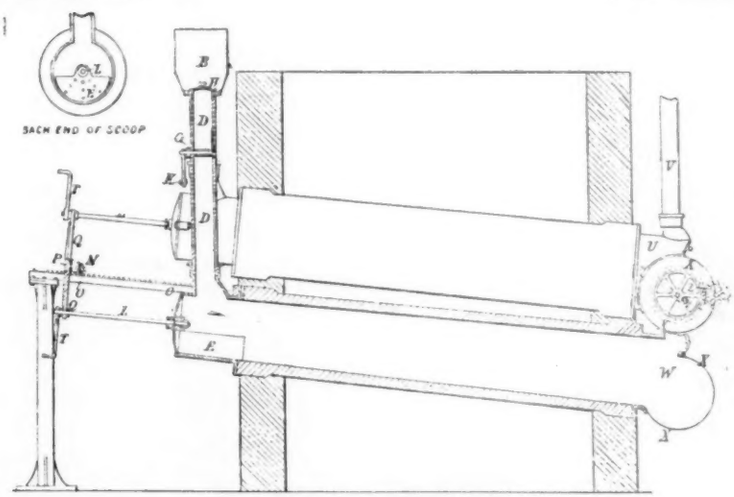
We have lately been courteously furnished by Mr. Elliott with enlarged drawings of his apparatus as applied to a bench of five retorts at Ludlow, and from them the illustrations given below have been prepared. These, with the description accompanying them, will, we think, put our readers in possession of all the details of the arrangement. As the question of the supercession of retort house labor by mechanical appliances is being seriously considered by gas managers, the publication of the following particulars will be specially opportune at the present time, supplementing as they do the account of M. Coze's and other systems of inclined retorts which appeared in our last issue.* Mr. Elliott has been working incessantly during the past four years at perfecting his process; and the result of its practical application has been to convince him that the work of the retort house can be performed by machine attendants as by ordinary stokers.



Front Elevation.



Back Elevation.



Section Through Center of Setting.

The retorts may be of the ordinary character, or they may be larger at the outlet end, so as to allow for the expansion of coke during the process of carbonization. *B* is a small open hopper for containing coal. This hopper is connected to the mouthpiece of each retort by a pipe *D*, provided with an arrangement to prevent the escape of gas while the coal is being let into the scoops or chargers *E* inserted in the mouthpieces. The arrangement for each pipe consists of a gas-tight cover *F*, working on a true surface fixed on the bottom of the hopper, and a coal regulator *G*, consisting of a simple plate loosely fitting the interior of the pipe *D*. The covers *F* are connected by a rod *H*, so that on pulling the lever they simultaneously open or close all the pipes; or the covers may be moved by means of a screw. The regulators, which only require a quarter of a turn to open them full, may be opened separately by means of levers fixed on their axes; or they may be opened simultaneously by connecting the levers to a rod *K*. The scoops are each fitted to a rod *L*, passing through the lid of the retort and having a lever *T* attached to the other end. The scoops are thrust into or withdrawn simultaneously from the retort by means of a cross-bar *P*, having as many arms *Q* as there are retorts in a setting. Each scoop-rod *L* passes through an opening near the extremity of its respective arm, so that on the shaft *N* being made to revolve, the pinions attached to the cross-bar will operate on the racks *O*, and cause the bar, and consequently the scoops, to advance or recede. To the opposite or back end of the retort there is also a kind of mouthpiece *U* (called the "tailpiece"), from which the ascension-pipe *V* rises. The tailpiece is provided with a hand-hole for cleaning the pipe; also with an opening *W*, which corresponds with an opening in the short cylinder *X*, which is pivoted to arms attached to the tailpiece. The latter is made to a curve of a true circle; so that the cylinder when brought up against it may turn, though in close contact with the facings of the tailpiece, and insure a gas-tight joint. The openings in the cylinder may be exposed for the discharge of coke by a handle attached to the axis of each cylinder; or the whole may be actuated simultaneously by means of the cogged wheels shown, fixed to a shaft and geared into other toothed wheels *Z* attached to the cylinders. The bearings of the cylinders are mounted in slots in the arms, and are there supported by means of springs, which keep the cylinders in close contact with the tailpieces.

The action of the apparatus, which is very simple, is as follows: The hopper being charged with coal, the covers are withdrawn from the tops of the pipes. The coal then falls till it fills the space between *F* and *G*, which when full contains a fixed quantity of coal. The covers are returned till they close the openings at the tops of the pipes, and the regulators opened, whereupon the coal will fall into the scoops below. The rods, and consequently the scoops, are then thrust in to their full length by the operation of the racks and pinions, and the scoops turned over by

*See our issue for Aug. 19, 1889, p. 337.

means of the levers. The coal will thus be deposited on the bottom of the retort, ready for carbonization. The rods are then drawn outwards and the scoops returned to their former or normal position under the pipes. After a short interval, to allow the coke to become caked, the scoops are again charged with coal, thrust forward and turned over. In thrusting forward the second charge of coal that which has already been introduced will be pushed towards the opposite end of the retort; and by repeating the operation the coal converted into coke will fall through the opening in the tailpiece into the cylinder. On the cylinder being turned by the means before described the coke will fall out by the opening in it into a barrow or other convenient receptacle. The coke will now be discharged at the same rate as coal is being introduced at the other end of the retort.

With reference to the results of the practical application of the system, Mr. Elliott says: "The apparatus has been continually at work at Ludlow during the past 18 months, and in the summer months has made all the gas required for the town. Each retort receives a charge of ¾ cwt. once every hour, or equal to 16 cwt. per 24 hours, with 10-feet retorts. The quantity of gas produced is 10,000 cubic feet of 16-candle power, using Talk-'o-the-Hill coal and no cannel. The coke comes out hard and bright, with very little breeze. The time occupied by one man in charging a bench of five retorts and turning the coke cylinders is two minutes. Thus one man would be able to take charge of at least 12 benches. No skilled labor is required, as any ordinary laborer, after being once shown, will have no difficulty in working the apparatus. When a number of benches are worked power would be employed, the apparatus being geared to shafting running the entire length of the retort house. With suitable machinery I estimate that two attendants would be able to work at least 50 benches of retorts. The apparatus would be made to work automatically. After one bench has been charged the apparatus at the next bench would be thrown into gear, and so on to the end of the retort house. When this is reached it will be time for the first bench to be charged again. The machinery is not complicated, and requires only five simple motions to complete the operation. Owing to the retorts not being opened to the air, and the coal being introduced in small quantities, there is a saving in fuel. The retort house is not so unpleasant as is generally the case, as there is little smoke, and the coke does not require any quenching. With better heats and the retorts made a little larger at the outlet end there would be no difficulty in carbonizing 20 cwt. of coal per mouthpiece per 24 hours. The reason of more coal being carbonized by this system is that it is moved at short intervals during its progress through the retort, thus allowing the gas to pass off more freely."

Views of Mr. George Westinghouse on the Outlook for Artificial Fuel Gas.

Last week we noted editorially that Mr. Westinghouse had written a letter to the New York *Sun* in which he defined his present opinion respecting the fuel gas question. Herewith we print the letter in full:

Sir:—Your editorial notice concerning the fuel gas problem, in which you give me credit for a very valuable discovery, prompts me to ask for some of your valuable space.

A company with which I am connected—the Fuel Gas and Electric Engineering Company, Limited—has devoted about three years to the heating gas problem. The investigations have been carried sufficiently far to show that a new process for the manufacture of gas is not needed to bring its use for heating purposes within the reach of the many. Instead of the energies of the Company referred to having been devoted wholly to processes for the manufacture of gas, the greatest attention has been given to the development of appliances for the use of gas, and already many devices have been perfected having such efficiency that their use in connection with ordinary illuminating gas will, when taking into consideration the saving in labor, dust, and dirt, prove economical as compared with coal.

In the near future, when the illuminating gas companies make it a business to introduce economical devices for the burning of gas, it may be expected that the citizens of New York and other large cities will use gas very largely for cooking and other domestic purposes.

There is a simple device for the heating of water that ought to be in every household. By lighting a gas jet and turning on the water at the same time water is boiled in about 50 seconds, and will run continuously at the boiling point at the rate of 70 gallons, with a consumption of about 50 cubic feet of gas per hour. There are roasting devices wherein the radiant heat of the gas is reflected upon the meats to be roasted, and the result is a saving of from 10 to 15 per cent. in the weight of the meat, which is lost by the present method.

Heated air prefers the top of the room, and thus leads to the consumption of a large amount of fuel in order to get a small amount of heat upon the floor, where it is most needed. A European invention is so designed and arranged that about 50 per cent. of the heat is reflected upon the floor, so that at a distance of 10 or 20 feet from one of these contrivances, set in an ordinary fireplace, the heat can be readily noticed upon the floor. Not only is the heat reflected upon the floor, but the heat in the products of combustion is utilized in warming the air in the room, which it puts in circulation. So economical is this stove that about 35 per cent of the entire heat units contained in the gas are made available, as against 10 per cent. from coal grate fires. In all bedrooms, and for heating in moderately cool weather, stoves of this character, from a sanitary point of view, would be worth their weight in gold; for in one minute after lighting the gas jets the reflected heat may be felt upon the floor.

In Europe, where a very careful investigation has been made in the interests of the Company referred to, innumerable devices were found, of more or less merit, and which were being largely introduced because of the economical results, among a people who of necessity regard expenditures more closely than the people of this country. It is known to a fraction of a foot how many cubic feet of gas are needed to broil a steak, to cook a bunch of asparagus, to boil a cabbage, and to roast a pound of beef.

So soon as the people of New York and other large cities understand what has been done and are able to secure the necessary appliances, they will believe that the gas age has really come.

The present cost of manufactured gas is largely due to the great percentage of leakage, and the comparatively small quantity of gas transported for an average of 20 hours per day. When a large quantity of gas is used for heating during all hours there will be no special need for a better process of manufacturing gas than the present, for the greatly increased consumption will lessen the price, and that, in connection with the economical appliances, will bring what is truly a great luxury within the reach of all classes. However, the importance of the manufacture of a cheap fuel gas is more fully recognized now than ever before, and there are hundreds of gas engineers to-day working on the problem, and there is every reason to expect that most excellent results will follow such persistent labors. The work begun three years ago on this subject is still being followed by people in my interests, though it is made of secondary importance at the present time, the first importance being given to the development of appliances for burning gas economically.

GEORGE WESTINGHOUSE, JR.

PITTSBURGH, Oct. 24, 1889.

The Stearns Gas Generator.

Letters Patent (No. 413,767) were granted on October 29 to De Witte Stearns, of Des Moines, Iowa, for improvements in gas generators. The following illustrated description of the Stearns method is taken from the inventor's specification:

"This invention relates to improvements in gas generators for converting liquid hydrocarbons into gases; and it consists of a series of retorts, each composed of rows of pipe alternately connected at their ends and triangularly arranged, said retorts being nested together by the inversion of the alternate ones, and also of simple means whereby they may be readily cleaned. It is a division of an application for letters patent filed by me on the 12th day of June, 1888, and known as Serial No. 276,836, and said generator is shown in the drawings in conjunction with other apparatus not here claimed.

"In the drawings, Fig. 1 is a front elevation, partly in section, of my improved apparatus for the production of gas from liquid hydrocarbon; Fig. 2 is a longitudinal vertical section of the same on the line x x; Fig. 3 is a sectional view of the inlet of one of the retorts; Fig. 4 is an elevation, partly in section, of a modification in the arrangement of the retorts, and Fig. 5 is a view showing the manner of connecting the front ends of the adjacent pipes of the retorts.

"The retorts a b c, in which the gas is produced, consist of sets of pipes arranged in rows embraced in a triangular area, each alternate retort thereby formed being inverted, as shown in Figs. 1 and 2, or reversed, as shown in the modification, Fig. 4. The purpose of this arrangement is to economize space and to better utilize the heat from the furnace above the burner tile d d. The outlet of the central retort b, or, in the form shown in Fig. 4, of the lower retort c, is connected to the burner d by the pipe e, the end of which is provided with the nozzle e', which projects into the closed end of the mixing chamber f to or past the air inlets f', the areas of the orifices of which are controlled by the valves f^2, and this mixing chamber passes through the front wall g and

enters the forward end of the burning chamber d'. To insure the flow of gas from the retort b, the pipe i from one of the steam superheaters is arranged to enter the pipe e and terminate therein with a nozzle, as shown in Fig. 2.

"The steam superheaters h, placed above the retorts $a\ b\ c$, are supplied with steam from the pipe h' through the horizontal pipes h^3. The superheated steam passes from the superheaters into the entrance ends of the retorts $a\ b\ c$ through the connecting pipes i, at which points it comes in contact and mixes with the liquid hydrocarbon and carries the same

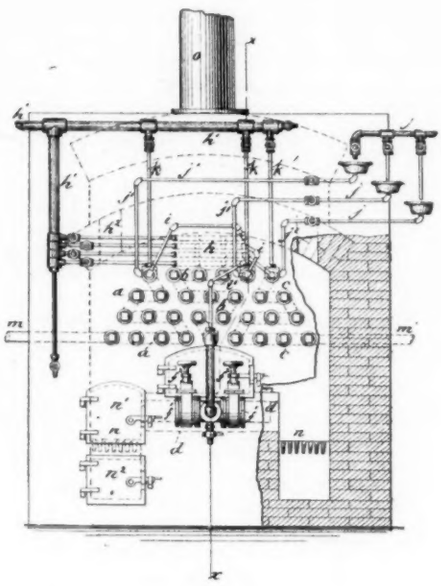


Fig. 1.

into the retorts. The liquid hydrocarbon supplied by the pipes j enters the entrance ends of the retorts through the pipes j'. To facilitate the entrance of the hydrocarbon into the retorts, pipes k extend from the steam supply pipe h' to the retorts, each being provided with an injector nozzle k', arranged within the entrance ends of the retorts, as shown at Fig. 3.

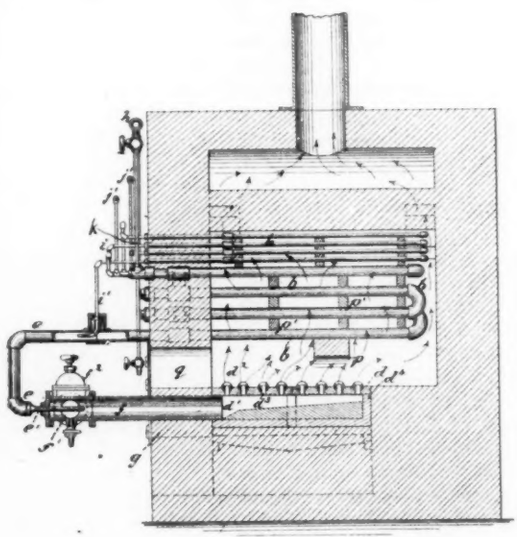


Fig. 2.

"The pipes composing the retorts $a\ b\ c$ are connected together in pairs at their front ends by T's, and with nipples joining the side branches of the T's, and to facilitate the cleaning of these pipes they are extended from the T's in a straight line through the front wall g by short pieces of pipe, the ends of which are closed by means of plugs. One of these connections is shown at Fig. 5, wherein $l\ l$ represent the T-pieces, l' the connecting nipple, l^2 the front extension pipes, and l^3 the plug. The removal of these plugs l^3 permits of any suitable scraper or cleaning implement being passed into the retort pipes for the extraction of any deposit that may occur therein without disturbing any of the connecting joints.

"The gas generated in the two outside retorts a and c, Fig. 1, is carried off for illuminating or heating purposes or for storage through the pipes m and m', connected to the exit ends of such retorts.

"At each side of the gas burner, and arranged near the bottom of the furnace, is a small grate n, upon which a wood or other fire may be kindled to initially heat the retorts, the necessary fuel being applied through

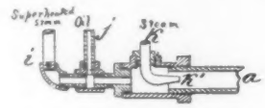


Fig. 3.

the doors $n'\ n'$, and the ashes removed through the doors $n^2\ n^2$ in the front wall g. By this arrangement of grates at the sides of the gas burner dirt and ashes from the starting fires are prevented from being deposited on the burner and obstructing its gas orifices.

"Gas previously produced by the apparatus or otherwise, if conveniently stored, may be supplied to the burner to initially heat the retorts and start the generation of the gas in lieu of using fires in the side grates. When the retort b becomes sufficiently heated to convert the steam and liquid hydrocarbon into gases, the gases therein formed pass through the pipe e and the mixing chamber f into the chamber d' of the burner, taking with them through the openings f' of the mixing chamber the quantity of air necessary to insure perfect combustion. The amount of this air supply is controlled by the adjustment of the air valves f^3. The mixture of the gases and air so produced fills the chamber d' with a uniform pressure throughout and issues therefrom through the orifices in the tiles d, and a steady and uniform fire over the whole extent of the burner tiles is thereby secured upon the ignition of the gas, and economical distribution and utilization of the heat therefrom among and by the pipes composing the retorts $a\ b\ c$ results in part therefrom and in part from the relative arrangement of such pipes, and the products of combustion not utilized finally escape through the flue o. The lower layers of pipes of the retorts are supported on the narrow

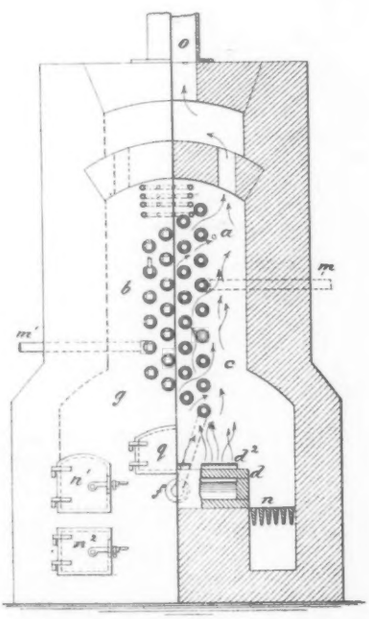


Fig. 4.

Fig. 5.

arch p, and the successive layers of these pipes are held out of contact with each other by the spacing bars p'.

"The number of the retorts may be varied at pleasure, according to the exigencies of the case. The novel method of inverting or reversing the position of the alternate retorts, besides more fully utilizing the heat, admits of the arrangement of a group of such retorts vertically, as shown in the modification, Fig. 4, thereby economizing floor-space when desired."

Dr. Leonard Waldo believes that Gas as an Illuminant has had its Day.

Dr. Leonard Waldo, of Bridgeport, Conn., in an address recently delivered before the New York Electric Club, made some rather radical statements, some of which sound like nonsense, and others of which (particularly his prophetic utterances in regard to the continued use and extension of gas as an illuminant) are nonsense. We submit the following abstract of the Doctor's remarks to the judgment of our readers:

We know that the light of the twentieth century is to be found in electricity. We know that we are public benefactors when we turn the light of electrical day into the dark corners where crime and pauperism make property unsafe and life wretched; and yet I think there is not one of us but feels in our inner hearts that there is something wrong when we allow our angel of life and light to become an angel of death.

It is a stinging rebuke to our scientific and business enterprise when this faithful lineman or that ignorant or inoffensive child becomes a victim to the power we are distributing.

We all know the steady battle which progress is always waging. Perfection only can come after this difficulty and that, unforeseen at the commencement, have been surmounted.

Each individual case of the applications of electrical power presents new difficulties and different ones from any of its precedents. The lighting of a closely populated metropolis is a very different problem from that of lighting a coal mine or a village; in the metropolis the electricity is harnessed to many needs; the exquisitely delicate telephone, the heavily belted engine, the telegrapher's key and sounder, and the electrical plater's vats are all members of the swarm of electrical powers. They each have their rights; they each have their representatives in such a club as ours. Nowhere else can the fruitful tree of concerted action be so well planted and tended as around the genial fires of our club.

It has happened to me in the line of professional work to have been in charge of the most powerful dynamos the art of man was able to construct at the time of their erection. I have seen those dynamos running day and night, tended by relays of ordinary workmen, and blazing away continuously from three to six thousand amperes of current and feeding the blinding mass of electricity through groups of seven carbons, each carbon 2½ inches in diameter, in the furnaces which were melting the sands of the sea, and in which firebrick melted and ran like molten metal.

I have seen the connections of copper cable handled with the utmost impunity by the commonest day laborer around the works, and with no more thought or concern than he would have shown in handling a spade or crowbar.

The current through the twisted cables produced about the copper so strong a magnetic field that a small bar of iron would be held by the copper cable as by a magnet.

I suppose that the amount of current ordinarily proving fatal is between one-tenth and one-twentieth of one ampere, and that the laborer handling such furnace conductors would be instantly killed if so much as $\frac{1}{500}$ of the current left the bare conductor and passed through a vital organism.

Now, is there any very good reason why conductors which are meant to deliver at arc light terminals, say 10 amperes current, should be so fraught with danger when their insulation is broken?

Is it the price of copper which makes multiple wire distribution too expensive? Is it the invasion of the patent field by men who have been quick to combine old principles and common knowledge into new combinations by which vested capital was protected by the courts? Have our engineers made the mistake of forgetting the value of human life, and networked a community with conductors having poor insulation from within outward, and who have failed to anticipate the necessity of protection from without inward?

It is not so difficult to make the current keep its proper path by outward insulation, but it is very difficult to make the insulation stay where it is put when attacked by the chemical destroyers in the air and the physical accidents of storms, cuts and blows.

As to burying such conductors, about all that can be said is that they will make a very lively graveyard for some of their mild-mannered and inoffensive telephonic and telegraphic fellow corpses.

In Paris they are fond of catacombs and underground tunnels and that sort of thing, but in New York the earth beneath and the waters under the earth conspire to make such burial probably impracticable. As it was said of marriage, it might be a failure, but celibacy was a much greater one.

Now, if copper profitably mined at 6 cents and paid for by us at 11 is too expensive to establish the proper mains in New York for low tension lighting, it is right here and among our own possibilities that we can discuss and formulate the legislation necessary to give us raw material for making metropolitan electric lighting safe and economical; the low tension current of such an electrical furnace as I have before referred to would supply perhaps 5,000 incandescent lamps with perfect safety, but to distribute these lamps will require plenty of copper, and the ultimate economy of long distance transfers of light or power is a question of the cost of copper.

Copper with us is raw material, and after our bitter experience with the copper syndicate I can conceive of no argument which can be used with electrical people for adhering to a protective tariff on copper.

There is no use in the gas people thinking that they are the people to furnish light. For lighting purposes gas is as certainly doomed as the stage coach upon the appearance of the railroad. The province of gas in the future is to supply heat and not light, and if we are temporarily exposed to the comment of an indignant public, it is because we have builded according to the light we then had, and not always wisely nor well, and have been hampered too much by the ignorance of legislators or the importunities of stockholders, and have strained the capacities of individual lighting systems by placing them in positions for which they were not, on the whole, adapted.

The energy and practical skill of the exploiters of any given system are dangerous to the community, unless they are accompanied by the kind of knowledge which informal discussion in such a club as ours would give. The public once roused is a good deal of a mob, and they are apt to fall upon the just and the unjust alike; it is for us to play a strong part in moulding and enlightening such public opinion, and to see to it that our social standing and the good, honest work which we do is such as to make us a power in the community in any cause which we champion.

Smit's Precision Center Punch.

In laying out plates for small boilers, or other work for punching, it is known that the rivet holes have to be marked in circumference and afterward center punched. In punching, the plate has to be shifted until the circumference of the punch is exactly over the circumference drawn on the plate. This operation is very tedious, and is often done carelessly. The man who punches cannot observe quickly enough if the plate is exactly in its place, and punches, therefore, outside the required area.

Having a center forged or cast on the punch, as is sometimes done, reduces the trouble; but these centers to be strong enough must be very short, so that the man can scarcely see if the mark is in the center. Most of these centers are not strong enough, and break off.

To obviate these difficulties Mr. P. Smit, Jr., of Slikkerveer, near Rotterdam, has invented the precision center punch. In his device a small hole is drilled through the center of the punch, which has a recess on the top for holding the head of the precision mark. On the top of this mark, which is a steel bolt of ½ inch diameter, there is a little spring for pressing the mark outward, and which is driven inward in punching. The precision center may come down for ½ inch, so that the workman has a clear view on his work, while breaking is impossible. This little arrangement is not patented.

The Dewey Process of Refrigeration by Electricity.

It is well known that the passage of a current across the junction of two dissimilar metals produces heating or cooling, according to the nature of these metals and the direction in which the current flows. This phenomenon, known as the Peltier effect, has been an interesting scientific fact for many years. While the heating of dissimilar junctions by the passage of the current has, it is true, been applied in one or two ways, the cooling effect seems to have attracted little or no attention from a practical standpoint. Our readers, says the *Electrical World*, will therefore be interested in a patent which has just been issued to Mr. Mark W. Dewey, of Syracuse, N. Y., in which the cooling effect produced by the electric current in the manner above stated is employed for freezing and refrigerating purposes.

Mr. Dewey, in his patent, describes a number of different methods of applying the principle, in which the cooling junctions are placed within a box and connected with a source of current. The heated junctions outside of the box are provided with large radiating plates, which dissipate the heat generated there. Another application is described in which the heated parts are located in a pipe connected with a ventilator, by which the heat is carried off.

In addition to making use of the Peltier effect, Mr. Dewey shows an-

other form of apparatus, in which the Thomson effect is made use of, in which differences of temperature in different parts of the same conductor are maintained by the passage of the current when the conductor is unequally heated. A continuous wire of iron or alloy is run alternately without and within the receptacle to be cooled. The exterior or warm coils are heated at the commencement of the operation by some external source, such as a gas jet or an electrical heating device. Once the difference of temperature is established it is maintained by the action of the apparatus on account of the different rates of cooling between the wire within and without the box, and this difference may also be maintained by making the external wire finer than that within the box, so that its temperature is always higher. Mr. Dewey also suggests that this class of apparatus may be used alternately as a refrigerator or heater by simply reversing the current.

Steam and Water Joints.

[A prize paper contributed by "J. H. R." to the *Mechanical World*.]

The question of how to make reliable steam and water joints, and the materials to employ, should, in the present days of extreme pressures, receive careful consideration in order to use the materials at command to the best advantage. The substances used must be able to endure high temperature, great pressure—accompanied sometimes by water—and the unavoidable contraction and expansion. The character of the joint will depend upon its situation, style of flanges and other circumstances. We will first enumerate and explain the composition of the materials generally used for these joints, then point out their special advantages and the most advantageous situation to use each one.

Asbestos millboard, paper pulp and asbestos fiber, hard vulcanized rubber rings and soft sheet rubber, rubber "insertion," composed of alternate layers of vulcanized rubber and canvass; wire gauze "insertion," fine brass wire gauze, having a layer of vulcanized rubber on each side; wire gauze and "putty," fine brass wire gauze and red-lead putty—*i. e.*, equal parts red and white-lead; hard lamp-wick, same as that used for petroleum lamps; soft hempen "spun yarn" and "putty," soft lead wire, gutta percha rod and rings.

Now for the best places to use these materials, so as to take advantage of each one's special properties.

We will take the case of the high pressure steam cylinder cover joint. This requires a material that will stand great heat and pressure, yet it must leave the flange faces readily, so as to lift the cover easily for inspection or repairs to piston, etc. The joint must last a fairly long period, as these large rings are expensive. Asbestos millboard is found to be the best substance to use for this class of joint, solid rings to cover the whole of the flange faces, said rings to be punched with holes for the studs, which hold cover in place. These asbestos rings, if carefully smeared with a mixture of plumbago and tallow, or rubbed with plumbago alone on each side to keep them from adhering to the joint faces, will last for a long time, during which the cover may be lifted many times if the joint is carefully removed and rubbed with the plumbago or plumbago and tallow before replacing. Solid rings of hard vulcanized rubber are sometimes used instead of the asbestos, but they do not last so long or answer so well. Hard lamp-wick may be used in an emergency if either of the above is not at hand. Red-lead "putty" is sometimes used, but it is *very* difficult to remove the cover, the putty setting so hard, and there being such a thin layer of it. So that if great care is not used when driving the small steel wedges used to break the joint, the cover itself may be cracked.

Never make cylinder cover joints with "putty," unless you have nothing else at hand. Slide-valve cover joints are made in the same manner as those of cylinder covers. The joints may be cut out of the solid or composed of strips dovetailed together at the corners. Asbestos is commonly used, but the remarks made *re* horse power cylinder covers apply to slide-valve covers as well.

Low pressure steam cylinder cover joints may be made with hard lamp-wick soaked in paint or cylinder oil. Soft lead wire turned into a ring and the ends soldered together is sometimes used. Of course, asbestos millboard can be used if the expense is not objected to, but it is quite unnecessary, as the heat and pressure in the low-pressure cylinder are very low.

The materials used for steam pipe joints should vary according to the locality of the joint, style of flanges, etc. The best flanges for the smaller steam pipes are those known as "hydraulic" or "spiggot" flanges. These have a recess in one face and a corresponding projection on the other to fit in the recess; but the projection must be longer than the recess is deep, so that when the jointing material is in place the outer faces of the flanges do not come in contact. Solid asbestos rings are generally used with these flanges if they are made of the same metal, both copper or both iron.

The plain flange as commonly met with is used for steam piping, both large and small. Greater care is required in making a joint with these flanges than with the "hydraulic" or "spiggot" flanges, as the walls of the recess in the latter keep the asbestos from being blown between the flanges if from any cause the tension on the bolts is slackened. Plain flanges having a large number of small bolts are preferable to those having a few large ones, as the pressure on the flanges is more equally divided, and they are not thrown out of shape so much as when the bolts are wider apart. In situations where very little water collects, asbestos millboard can be used with advantage, if there is very little water present and both the flanges are of the same metal. Asbestos millboard should never be put between copper and iron—such as between flange of stop valve casting on boiler and main steam pipe to engines; the former is usually of cast iron and the latter of copper. I have known the cast iron face of such a joint to be deeply pitted, owing to the electrical action set up between the copper and iron, having a porous diaphragm of asbestos soaked with condensed water between them, thus forming a "constant battery." Wire gauze and red-lead "putty" are materials to use in such a case. "Rubber insertion" is used where the joint is fairly easy of access, so as to screw up the nuts as the rubber becomes softened by the heat. This must be done until there is a good strain on the bolts and nuts. Of course the insertion is to be well greased with tallow and plumbago before using, and the flange faces cleaned and filed flat where practicable. Where a joint is in such a position that it can only be made when steam is down, the best plan is to use brass wire gauze and red-lead putty. All cocks on the boiler should have this joint. Having tried many substances I find none equal to the old plan—used many years on locomotive engines—of "gauze" and "putty" for all plain flange joints that do not require breaking frequently and have to endure high pressure and great heat in the presence of water. To make this joint last the longest possible time two thicknesses of brass wire gauze should be used, having the holes punched out for the bolts, the center hole for the steam to be cut with scissors. Each side of the pieces of gauze should be covered with a thin layer of stiff red-lead putty, the faces of flanges being thoroughly cleaned, the gauze and putty placed in position, and the nuts screwed hard down; if the joint is allowed to harden a little before the pressure comes on it it will not require removing for years.

For pump cylinder covers, valve covers and all plain flanged joints for water under pressure, wire gauze insertion, or, failing that, ordinary rubber insertion. All rubber and asbestos to be well rubbed with plumbago or plumbago and tallow before putting between the flanges to prevent it sticking to them. Joints in pipes conveying water under pressure, say, 600 or 700 pounds per square inch, have the before-mentioned hydraulic flanges having the recess and projection; in the recess is placed a ring of guttapercha about ¼-in. thick. These rings are very simply made from ¼-in. rod, long enough to form the sized ring required and a little over for lap of the joint. If the ends are now heated in a lamp and pressed together, the ring is quickly made. In use the ring flattens out, owing to the pressure of one flange against the other by the pull of the bolts, and coming against the outer rim of the recess is there stopped, thus making a capital joint for resisting cold water under heavy pressures. Manhole and mudhole joints on boilers should be made with oval rings of hard vulcanized rubber of the required dimensions; not having these at hand, rings formed of rubber—square in cross section—can be used. The square rubber is cut to the length required, with sufficient over for making a scarfed joint of about 2 inches long; the ends are scarfed, put together, and tied with sewing twine temporarily, now tried on the door, and, if a good fit, then the scarf is "served" with sewing twine, wound closely together, and the ends fastened with a knot. This makes a good joint for pressures up to 100 pounds per square inch. If required two rings can be used, placed one outside the other with the joints on opposite sides of the door. Supposing we have no rubber at all, then hempen spun yarn can be used, rubbed with stiff white lead. This makes a fairly efficient joint for pressures up to 60 pounds per square inch. It may stand higher than this, but I have not tried it for above 60 pounds.

THE Inter-State Gas and Water Works Company, of St. Louis, Mo., has secured a contract and franchise for lighting Holden (Mo.) by electricity. The Company is to have an exclusive franchise for 20 years, and the city agrees to make a contract with the Company for the public lighting for 5 years, the first allotment of lamps to be 30 incandescents, of 30-candle power each, to be paid for at the rate of $15 per annum. A moon table is to be followed.

Electric Lighting Progress in London, England.

In the course of an interesting interview (printed in the *Pall Mall Gazette*), Lord Crawford made the following remarks regarding the progress of the huge electric installation in London, under the auspices of the "London" Company:

"The Company," said Lord Crawford, "began practically through Sir Coutts Lindsay undertaking, in November, 1884, to light the Grosvenor Gallery with electricity. When he decided to do that he received offers from neighbors to supply them with the light, and the work was made in consequence much larger than was originally intended. By October, 1885, two small engines and four small dynamos were at work, with a capacity of 10,000 lights. We then found that insufficient, and ordered two more dynamos, from Ferranti, of a capacity of 10,000 lights each, and put down another engine. Ferranti's dynamos were nominally 10,000, but they were capable of supplying 18,000. The demand kept on increasing, but we were unwilling to take on more than 30,000 lights, for there was no space available, and indeed the whole of the conditions of the engine room were very unfavorable for ventilation, it being 40 feet below Bond street, right under the Grosvenor. In October, 1887, we found it absolutely necessary to move, and consequently we extended our Company and adopted the name of 'The London.' There were only seven of us up to this time in the business, that is to say, seven shareholders. These now form the Board of Directors.

"The difficulties we had to encounter were such that no company would have faced them. We were pestered with injunctions and claims for compensation by surrounding property owners. Our electrical difficulties were comparatively trifling. We spent, of course, a certain amount of money on experimental work, but our difficulties were mainly mechanical, owing to the cramped position of the Grosvenor."

"Why did you go to Deptford?"—"When we decided to form a new company we came to the conclusion that no central station placed in the heart of London could ever succeed, owing to noise, the expensive coal which must be got to avoid smoke, and the great difficulties of carting this coal, when burning a large amount, through the streets, especially in the winter time, with frost and snow. We consequently looked for a freehold at the side of the river, and, after considerable hunting about, we found a station at Deptford, and bought it."

"What would you reckon the saving to be?"—"We shall put the coal under the boilers at half price, and, when we are in full work at Deptford, that is to say, running 2,000,000 lights, we shall burn 1,000 tons a day. We shall also use Thames water for condensing purposes, and the amount passing through our condensers will be equal to the daily supply of London.

"Our land at Deptford is a little over three acres in extent. We commenced erecting our works in April, 1888, and have been at it night and day ever since. Now we have a very large engine house erected, and have engines and dynamos at work of 3,000-horse power. Two other dynamos and engines are in course of erection of 5,000-horse power each. The boiler power we have put down is 14,000-horse power. We found, when we inquired as to the construction of these dynamos, that there were no tools big enough to deal with them, except a few in arsenals and private works. We tried Krupp, in Germany, and the Kreuzot works, in France, and neither of them would contract to deliver under three years. As it did not suit our purpose to wait so long, we put up machinery ourselves, at an expense of £5,000 to £6,000, and we shall be able to complete these dynamos in a year. They are of unprecedented size. The lathe required to turn the main shaft is of the same dimensions as that used for turning the 100-ton gun at Woolwich.

"The shafts are 36 inches in diameter, and in the rough weighed 70 tons. They were the largest castings of steel ever made in Scotland. The dynamos of the Grosvenor are only 9 feet, and those now erected at Deptford 13 feet. As to their lighting power, the Grosvenor dynamos have a nominal power of 10,000, but actually 18,000 each. Those working now at Deptford will supply 25,000 lights, and the two being constructed will rise to 100,000 each. These new ones are devised so that as the demand arises we can put another engine upon each dynamo of 5,000-horse power, so that each will be up to 10,000-horse power, making them 200,000 lights each nominally.

"We are also manufacturing the mains ourselves, and four machines are turning them out in 20-ft. lengths. This is all that we require for 100,000 lights. The largest of our mains will be 2½ inches over all, and the smallest 1¼ inch. There is no cable. We have a tube of copper, having a quarter of an inch of sectional area, through which the current is sent out. This has a cover of insulating material, and a second copper tube is compressed round that for the return current. Another thin layer of insulating material is used, and over this is placed an iron tube, also 'drawn down,' or made tight, for mechanical protection against pickaxes in the street. With this main we require no box or brickwork in the streets, as it is put naked into the earth. The outer tube is of wrought iron ¼ inch thick, and is sufficiently flexible to bend at right angles without breaking, while strong enough to resist any weight that may go over it without damage. There will be a joint for 'service' at each 20 feet, so that every house can have the light if required. A main on this principle is absolutely safe. A man can touch the naked copper with impunity, as it is already, as it is technically called, 'to earth.' He is on the earth, and is therefore touching the earth. The only way in which he could get a shock is by cutting the main open and getting to the interior tube; so that he would have deliberately to cut through the thickness of iron, then a thickness of copper, and through the insulation before he could reach the point where damage could be done. There is the same protection against danger from the connecting wires.

"The primary current is sent up at a tension of 10,000 volts. That pressure has never been approached before in electrical work. What we are doing at the Grosvenor is as high as anything that has ever been done, and the tension there is 2,400 volts. We bring up our mains to distributing stations, where the tension is reduced from 10,000 volts to 2,400 volts. Then it is sent through the streets underground exactly as we do at the Grosvenor, and at each house it is again reduced by means of transformers to a working pressure of 100 volts. By arrangement with the Railway Company the current is brought up from our generating station at Deptford along the South Eastern line. We have running powers into Cannon Street Station, over Ludgate Railway Bridge, and over Charing Cross Bridge. Two mains are laid alongside the line. The advantage of this is that we have got a private way, in addition to the right of way through the public streets under our Order, which we intend, in due course, to make use of. We have also running powers over the District Underground for these mains. Eventually we shall have eight or ten stations to distribute the light from, and at present we have practically six, including the Grosvenor, from which the machinery will be removed later on. These distributing stations need not be larger than a good-sized room.

"We do not regard our station at Deptford or our very high tension as an experiment, and although some people have suggested risks and drawbacks, we are unaware of them. It is much more economical to send electrical power from a distance if high tension is used, because the section of copper required is very much smaller. The section I spoke of just now, with a diameter of 2½ inches, will transmit with high tension 100,000 lights. With low tension (that is, 100 volts) they could only distribute 1,000 lights over a mile. In short, what we do is to bring it up undiluted and break it down to the required strength before supplying it to our customers. Although we are not actually at work sending the current from Deptford to London, for our own information we have been lighting Deptford from the Grosvenor, and the result has been equal to our expectations, although the conditions were unfavorable.

"The overhead cables which radiate from the Grosvenor have to come down within the space of two years. We propose to lay down a very considerable amount of underground work, and as fast as that overtakes the overhead the latter will be removed. The compulsory mains extend to about 30 miles, but we propose to lay down a great deal more than that. The City of London has not yet come to any decision. They divided their area into three parts, and invited us to tender for one, which we have done. Our area under our Provisional Order embraces 13 parishes, and extends from Greenwich to Westminster Bridge, on the south side of the river, taking in Greenwich, Deptford, Southwark and Newington; and on the north side from Charing Cross to Battersea, running up to Oxford street, and embracing Mayfair and Hyde Park as far as the Serpentine, down the Fulham Road to the end of Chelsea parish, and so to Battersea, back along the river as far as Vauxhall Bridge Road, along both sides of Victoria street, and to the river as far as Cecil street. Clerkenwell is also given to us. The parishes are: Chelsea, St. George's, Hanover Square, St. James', Westminster, St. James and St. John, Clerkenwell, portions of St. Martin's, St. Margaret's, Westminster and Lambeth, Newington, St. Saviour's, St. Olave's, Rotherhithe, Bermondsey, and Greenwich.

"There is no doubt about the demand for the light. The applications are coming in more rapidly than we can deal with them, and we have no doubt that for the next four or five years the demand will be ahead of the supply. The Deptford station will have a capacity of two million lights, and it is our intention before long to start another station out of London where we can get our fuel economically water-borne. We have quite enough capital to finish our present works, but when that is spent,

and the demands come in, we shall have no difficulty in getting all the capital we may require."

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. JAMES DANIELS, of the Shickle, Harrison & Howard Iron Company, of St. Louis, has just returned home from a visit to Hutchinson, Kansas, the said visit being made in connection with the proceedings that resulted in the organization of the Hutchinson Gas and Fuel Company. The incorporators and Directors of the latter are Messrs. M. D. Mather, of Austin, Texas; James Daniels, of St. Louis, and E. C. Meyer, J. B. Brown and L. A. Bigger, of Hutchinson. The new Company succeeds to the property and franchises of the Hutchinson Gas Light and Fuel Company, which had been supplying a gas manufactured under the Chamberlain process, the latter, however, resulting in failure. The present owners, having determined to introduce a water gas plant of the most approved type, are engaged in the construction of a new generating house (30 feet wide by 90 feet in length) to house a plant capable of putting out 400,000 cubic feet of gas per diem. The purifiers are to be 8 ft. by 10 ft. by 3 ft.; a new holder is to be put up, and the main system is to be extended. In short, the works will when completed be of the most modern type. The sale of gas for purposes other than illumination will be vigorously pushed, and there is every prospect that the Company is about to enter on a prosperous career. The Company is capitalized in $200,000.

WE understand that the City Council of Vincennes, Ind., proposes to annul the contract existing between the city and the Gas Company under which the latter was, because of certain concessions made by it in 1875, authorized to perform the public lighting for a term of 25 years—or until 1900. The rate agreed on then ($36 per post per annum for all night lighting) was justly held to be a most advantageous one for the city, and the authorities lost no time in accepting it, and while it is equally certain that the figure is rather in excess of what the lighting could be profitably supplied at now, the contract nevertheless is binding and valid, and we think would be so held by any court in the State. No doubt the law will be appealed to in this case, and while the equity in it is all on the side of the Gas Company, the latter would likely submit to a fair revision of the agreement. In connection with this case it is pertinent to ask would the authorities in the event of their now having the best of the bargain, be willing to concede an advance in the service price?

"As a supplement to my remarks in your last concerning the incorporation and organization of the Winnipiseogee Gas and Electric Light Company, Laconia, N. H., let me say that it is not at all improbable that the new venture will be absorbed by the Laconia Gas Light Company.—R. S."

THE following figures show the standing of the various gas light companies in the Boston district, as returned to the authorities on June 30, 1889—the end of the fiscal year:

Boston Gas Light Company.—Assets, $3,018,988; liabilities (capital, $2,500,000), $2,883,592; profit for the year, $135,396.

Bay State.—Assets, $4,974,555; habilities (capital, $5,000,000), $5,013,478; loss, $43,923.

South Boston.—Assets, $549,913; liabilities (capital, $440,000), $488,644; profits, $62,800.

Dorchester.—Assets, $549,913; liabilities (capital, $400,000), $402,249; profits, $147,663.

Roxbury.—Assets, $914,160; liabilities (capital, $600,000), $605,584; profits, $308,575.

Jamaica Plain.—Assets, $284,348; liabilities (capital, $200,000), $232,658; profits, $51,690.

Charlestown.—Assets, $591,141; liabilities (capital, $500,000), $545,425; profits, $46,516.

East Boston.—Assets, $291,188; liabilities (capital, $220,000), $231,000; profits, $60,188.

Cambridge.—Assets, $903,235; liabilities (capital, $700,000), $701,459; profits, $201,776.

A CORRESPONDENT remarks that there is likely to be lively competition over the next contract for the public lighting by electricity of Boston, which now pays at the rate of $237.50 per annum for each full power arc in service. The present contract expires on January 15, 1890.

ON the 11th inst. the Superior (Wis.) Water, Light and Power Company was furnishing to the city 139 gas lamps and 100 arc lamps on account of the public lighting, and the service was in every sense acceptable to the authorities and to the citizens. The resident Manager is Mr. John Mather, formerly of St. Paul, Minn.

MR. JOHN WILLIAMS, who had been in the employ of the Louisville (Ky.) Gas Company for many years, died on the 8th inst.

AT the instance of Alderman Crilly, of Hartford, Conn., a resolution requesting the Mayor to apply to the Governor for the appointment of a gas inspector to report upon the quality of the gas supplied in that city, has been adopted. The request is based upon the following provisions of the General Statutes of the State:

"Section 3,994.—There shall be an Inspector-General of gas meters and illuminating gas, who shall be a resident of Hartford or New Haven, and will be appointed by the Governor, and shall hold his office for three years. The Governor may fill vacancies for the unexpired part of any term.

"Section 3,997.—The Inspector-General and his deputy shall inspect monthly the quality and purity of illuminating gas furnished in his town, or any city or borough therein, if requested by the Mayor of the city, Warden of the borough, or Selectmen of the town, and report to them the result of such inspection, etc."

AT a regular meeting of the Conshohocken (Pa.) Gas Company, held about a fortnight ago, Mr. Frederick Light was elected President and Wm. H. Perrott a Director in place of William Henry Cresson. It was also determined to extend the main system. No advance was made in the negotiations for the purchase of the plant of the local electric lighting company.

THE Cleveland (O.) Gas Company started up its new retort house last week. The plant is a model of modern construction.

THE proprietors of the Meriden (Conn.) Gas Light Company have agreed to reduce the selling rate to $1.80 per 1,000 cubic feet, the reduction to go into effect on January 1, 1890. The local electric lighting company proposes to charge $10 per annum for each 16-candle power incandescent light, the rate for divided arcs to be $6 per month. This is on the basis of a midnight supply; but the proprietors also say that when 1,000 lights are in circuit the service shall be made to cover a period of 20 hours, with no increase in the service rates.

COLONEL ANDREW K. MACKINLAY, President of the Halifax (N. S.) Gas Company, died in London, England, on the 12th inst. He was in the 58th year of his age, and was a prominent figure for a great many years in Halifax commercial circles.

MR. C. N. FAY, whose resignation from the Presidency of the Chicago Gas Trust was reported some time ago, has been succeeded by Mr. C. K. G. Billings, Jr.

JAMESTOWN (R. I.) is in the market for a gas works. Although the place is a small one, it seems to us that an enterprise of this sort would prove a good business venture.

TAKING advantage of the excitement occasioned among the residents of Jamestown, N. Y., because of the recent increase in the rate for natural gas, Mr. Burdette Loomis appeared before the citizens committee which was appointed to consider the project of committing the city to the operation of a water gas plant for the manufacture and supply of fuel gas, and urged the adoption of his system. His estimate was $250,000 for the plant and mains necessary for the distribution of 5,000,000 cubic feet per day, and the cost of production was put at 7½ cents per 1,000 cubic feet.

THE Council of Sparta (Ills.) has contracted with the Electric Headlight Company for the supply on public account of 10 high candle power arcs to be lighted on 20 nights of each month. The rate agreed on is $90 per lamp per annum.

IN connection with the item regarding the request by the Council of Hartford, Conn., for the appointment of a Gas Inspector, it might be noted that Prof. W. G. Mixter, of New Haven, had acted as such for several years. In fact his incumbency of the office did not cease until the first of September last. The Governor did not then name a successor to the vacant post. It need not be supposed that the Hartford Gas Company is opposed to the appointment of an inspector, for the sections o

the statutes providing for such an official were, if we mistake not, drawn some years ago by Mr. John P. Harbison.

SOME days ago the City Council of Charleston, S. C., after a somewhat heated debate on the subject of public lighting, passed the following resolutions: "That in addition to the 31 arc lights now in use the Council contract with the Light and Power Company for 69 additional arc lights, making 100 arcs in all, to follow the moon, at $100 each per annum, equal to $10,000. That Council contract with the Charleston Gas Company for 810 lamps, 5-feet burners, as now, along the mains of said Company, to follow the moon, at $16.72 each per annum, or $13,464. That Council contract with the Gas Company to light the public buildings and institutions at $1.75 per 1,000 cubic feet." These resolutions were followed by the adoption of the further resolution, that should the Charleston Gas Light Company not accept the proposition in the contract within 5 days from the date of its passage the committee on lighting should be authorized to conclude a contract with the Charleston Light and Power Company to furnish either 810 incandescent lamps for $11,340, or to furnish 50 arc lamps and 510 incandescents for $12,140, as in the opinion of the committee would be most advantageous for the city.

A SUIT that is now occupying the attention of the Court of Common Pleas, Philadelphia, springs from a bill in equity filed against the Brush Electric Light Company, by Samuel Baugh, of 2025 Chestnut street. The latter is the site of a handsome 4-storied residence occupied by plaintiff, who claimed that the operation of the Company's plant prevents the inmates of the residence from enjoying rest and sleep. On this ground he prays that an injunction issue to prevent defendant from continuing to operate the plant. The answer is that the Brush Company paid every possible attention in its building details to prevent annoyance to the tenants of adjoining houses; that $400,000 was invested in the station; and that it uses every precaution to have its operation conducted in the quietest manner possible.

SECRETARY AND TREASURER H. E. GERHARD, of the Roanoke (Va.) Gas and Water Company, desires us to say that all supplies for the account of that Company will be ordered on a particular style of blank, which must be signed by Mr. T. F. Brinkley, Superintendent. Otherwise the Company will not assume responsibility for supplies shipped.

MR. J. J. H. BASSETT, formerly of Pottstown, Pa., is now in the service of the Roanoke (Va.) Gas and Water Company.

AN exchange says: "We see it stated that observers in many of the small cities blessed with shade trees have noticed that those trees near electric lights have been blighted by something, and for the lack of some better apparent cause, the trouble is ascribed to the electric lights. Arboriculturists say that trees need darkness as much as men need sleep. There seems to be some reason in supposing that the nearness of the electric lights is the cause of the drooping of the trees; for similar trees not exposed to any other illumination than that of the sun have not been affected in any way, and are bright and strong. While it seems somewhat improbable that such a statement can be well founded, still it will be interesting to those having shade trees near to electric lights to carefully notice whether such proximity has any appreciable effect on their vigor or life."

"ELECTRIC lights are an assured fact for Eureka Springs, Ark., Mr. J. A. Monagan, Superintendent of the Gas Company, having assured your correspondent that the city has granted his Company a franchise, to run 25 years, for the operation of an electric lighting plant. Under the terms of the franchise the plant is to be completed and in operation within six months from the date of the covenant. Better progress than that, however, is to be made, for the Company expects to have everything in working order by January 1st, next. The Company has already placed orders for the dynamos, etc., and an equipment is arranged for that will enable it to supply electric currents for motor power as well as for lighting. The Heisler incandescent system will be used, and the streets of the city will continue to be lighted with gas until the expiration of the present contract. By a clause in the electric franchise the Gas Company, however, binds itself—in case the city elects to change the public lighting system—to furnish to the authorities 25 high power arcs at $10 each per month, to be operated until 10 o'clock each night, or to supply an equal number, to run until midnight, on the basis of a monthly payment of $12 each. The business of the Company is developing in a satisfactory manner under Mr. Monagan's efficient methods. —EUREKA."

THE retorts and fireclay material for the new carbonizing plant of the Roanoke (Va.) Gas and Water Company were supplied by the Baltimore Retort and Firebrick Company.

WHILE the City Council of Charleston, S. C., is seemingly doing its best to cheat the Gas Company out of the right to its quota of the public lighting, the Gas Company still continues to give evidence of the progressive and liberal spirit of those in command of its fortunes. On the occasion of the Fall Festival, which is one of the season's events in Charleston, the managers of the affair determined to have a grand balloon ascension, and then instituted negotiations with the Gas Company for a supply of the necessary inflating material. The quantity of gas needed was estimated at 25,000 cubic feet, which was supplied, by order of President Turner, free of charge. Not only was this donation made, but 200 feet of temporary gas main was laid so that the pressure at the charging point would be at the proper standard.

ONE provision in the public lighting contract recently entered into between the authorities and the Negaunee (Mich.) Gas Light Company is to the effect that the lamps are to be lighted every night until 10 o'clock P.M. "when the moon is not of sufficient *size* to properly light the streets."

HARRY D. BLACKBURN, of Cincinnati, Ohio, has filed a mandamus petition, in the Circuit Court, to compel Harold Ryland, Secretary of the local Brush Electric Light Company, to permit the relator to examine minutes and books of the Company. He alleges that he has good reason to believe that the Company's affairs are not being managed in the interests of its stockholders, but in the interest of a certain individual or individuals, and that the assets and property rights of the Company are being misappropriated. He had applied for permission to examine the Company's books with a view to ascertaining the truth, and has been denied all access to them. The Court directed the issuance of a preliminary writ.

MESSRS. BARTLETT, HAYWARD & CO. are under contract to build the works at Huntington, L. I.

A FORTNIGHT ago we noted that the Columbus (O.) Gas Light and Coke Company had been purchased by a syndicate. In further explanation of the terms of the sale we print the following from the Columbus *Dispatch*, dated 15th inst.: "One of the largest transactions in a business way that has occurred in this city for years was consummated to-day. The negotiations, which have been in progress for some days past through the Deshler Bank, with Col. H. B. Wilson representing an Eastern syndicate of capitalists, for the purchase and sale of the Columbus Gas Light and Coke Coke Company, were concluded this morning, and arrangements were at once made by which the stockholders received the money for their stock. The price paid was $140 per share, which, as will readily be seen, is a pretty good-sized premium, showing the great desirability of the stock as an investment. This sale is next in importance to the sale of the Columbus, Hocking Valley and Toledo Railroad property, some years ago, through the same Bank. That sale involved the transfer of about six millions of dollars, while the present one is a little over one million. As partially indicated above, the sale was carried on through Col. H. B. Wilson, of Ironton, and Mr. Emerson McMillin, now of St. Louis, but for some years Superintendent of the Columbus Gas Light and Coke Company. Mr. Wilson states that through the Deshler Bank about 95 per cent. of the $720,000 was obtained, leaving about $30,000 worth of stock that has not been sold. He preferred not to give the names of the Eastern capitalists who have invested their money in the new enterprise, for fear of making some mistake. Mr. McMillin is now in New York city, and possibly has added new names to the list, or possibly some had dropped out; and for this reason he preferred not to mention any names in connection with the purchase. It would be the aim of the new stockholders to popularize the concern as much as possible, and at this time the indications are that no material changes will be made in the management, but, of course, the sale will require the election of a new President and Vice-President. Mr. McMillin has retained his position as advisory engineer, but it cannot be stated positively that he will return to this city and resume the active management of the works. Mr. Deshler states that all the stock would be taken by the new Company except that owned by Mr. Fred. Jaeger, who positively declined to sell at the figures mentioned. The Company was organized and put in operation about 1850, the late Wm. A. Platt, John Miller, and John N. Gill being the prime movers in organizing it. Mr. P. W. Huntington has for some years been the President of the Company. A *Dispatch* representative called upon Mr. Huntington this afternoon, and that gentleman said he

had not sold any of his stock, and did not propose to do so. Mr. Huntington declined to give any of the names of the large stockholders who were selling out, on the ground that 'the transaction was their own private business.'"

CERTAIN speculators, represented by a party named Wm. S. Crosby, have appeared before the St. Joseph (Mo.) City Council with a petition for the right to operate a fuel water gas plant in that city. They agree not to charge in excess of $1 per 1,000 cu. ft. for illuminating gas, and 75 cents per 1,000 for gas used for power, cooking, and heating purposes, unless accounts rendered for same are unpaid ten days from the presentation thereof. In the latter event the Company may add 25 cents per 1,000 to the face of the bills. This is the same joker that is now so well recognized in the West, and which has cropped out so frequently of late at divers points in that section. "Crosby and his heirs and assigns" propose to follow the Jackson (Mich.) plan—unless the St. Joseph Gas and Manufacturing Company should become one of the "heirs and assigns" in the usual way. Mr. Crosby, in introducing the virtues of the Jackson process to the attention of the St. Joseph Council, claimed that it was extensively used in England, which is news to us; and we might be forgiven for presuming that we had some knowledge of what was going on in gas circles on the other side. The measure was discussed at some length at the meeting of the Council at which the ordinance was first proposed, and as a sample of the "talk" that Crosby indulged in we give the following:

Ald. Todd—"Will 1,000 feet of your gas go as far as a like quantity of coal gas?"

Mr. Crosby—"Yes; it will make 20 per cent. more heat and within 3 per cent. as much illumination."

Ald. Jamieson—"Is it safe to use?"

Mr. Crosby—"Safer than any other, because it cannot be blown out."

Ald. Todd—"What size pipes do you use?"

Mr. Crosby—"Larger than for coal gas, because our gas is largely used for fuel, requiring a larger volume. There is perfect combustion in our gas, but it does not radiate as much heat as coal gas. No change in burners will be necessary. The magnesium points required in our illumination can be had for 3 cents each, and will last for four months."

Such trash as this ought to be sufficient to condemn Mr. Crosby and his process even in the opinion of a St. Joseph Councilman, and we incline to the belief, by the time President Turner, of the old St. Joseph Company, has finished the presentation of reasons in opposition to the granting of the proposed ordinance, that Mr. Crosby's usefulness as a canvasser for the Chicago concern that is presumed to be the power behind these desultory applications for fuel gas charters in the West, will be of small value. The Council has the application under advisement.

THE Naysmith Gas and Construction Company, "to make illuminating and fuel gas under the Naysmith process, and to dispose of territorial rights to the patents," is to be incorporated by Messrs. Arthur J. Wilkinson, Joseph W. Craig, Henry White, Percy L. Craig and Robert Naysmith, all of Pittsburg.

ELSEWHERE in these columns we note matters connected with the appointment of a gas inspector for Connecticut. Since writing that reference we have learned that the Governor has re-appointed Prof. William G. Mixter, of New Haven, who will appoint deputies to serve under him.

THE Directors of the Waltham (Mass.) Gas Light Company have issued a circular to the stockholders inviting the latter to give a power of attorney to Messrs. George A. Stearns, Arthur T. Lyman and Augustus Flagg, as Trustees, empowering them to sell their shares at a figure not less than $140, "if the interests of the Company shall warrant it." It is presumed that this means a revival of the former attempt made by the Bay State syndicate to secure the Waltham Company. The market value of the shares is something like 125, but as the security is a certain 6 per cent. dividend payer, with every likelihood that the rate will be increased to 8 per cent. within half a decade, it is by no means certain that the present circular will meet with the assent required.

THE repairs to the plant of the Lee (Mass.) Company's works are about completed.

MR. MALCOLM PETERS has resumed the resident and financial management of the Brockton (Mass.) Gas Company.

THE Board of Gas and Electric Light Commissioners gave a hearing, on the 18th inst., at the Chelsea (Mass.) city hall, on the appeal of the Chelsea Gas Company, questioning the authority of the Board of Aldermen to give the right to the American Fuel Company to lay pipes in the streets. After listening to some testimony and much argument the hearing was adjourned to Monday, December 16, for the purpose of granting the Fuel Company time to furnish further information about the way in which it proposes to manufacture its gas.

The Edinburgh Electrical Exhibition Buildings.

Supplementary to the information given in its issue for October 11, respecting the preparatory arrangements in connection with the electrical exhibition to be held next year in Edinburgh to signalize the opening of the Forth Bridge, the current number of *Engineering* gives a description of the buildings under plans prepared by Mr. W. Allan Carter, of Messrs. Carter & Penman, of the Scottish metropolis. In its general appearance the building somewhat resembles the structures now associated with exhibitions, and yet there are one or two distinctive features indicated in the perspective view. The characteristics of Moorish design are borrowed to give it a light and attractive decorative appearance, particularly in the case of two towers, which form a prominent feature in the elevation, as they flank the principal entrances, and in the series of domes with turrets at either end of the building. The Union Canal passes between the public road and the exhibition grounds, and the main building is built parallel with the canal. From the main road a steel girder bridge carries the entrance way over the canal, and this way, which, like the bridge, is covered in with a light awning, diverges in circular lines in two directions to the main entrances. The main building, which is 170 feet from the canal, is 700 feet long and 200 feet in width. Running across the center of the building at the entrance is the principal court, with a high arched roof, and on either side of the ceremonial entrance are to be reception rooms. The general courts right and left of this principal one are 50 feet wide. The total floor area is 177,000 square feet. There is to be a large concert hall 200 feet long and 100 feet wide, which will have the distinct advantage of being separated from the general exhibition courts. There will, of course, be the usual dining and refreshment saloons. At the west end of the building there is to be a promenade with verandah, from which a fine view of the grounds will be had. The suburban railway intersects the grounds, and is to be bridged by a strong timber structure 30 feet in width. On the side of the railway opposite to the main building is to be the general machinery hall, 700 feet long and 150 feet wide, having a floor area of 99,600 square feet, and in close proximity there will be a boiler shed. Throughout the buildings there will be the usual structures. When the plans were before the Dean of Guild Court at Edinburgh the Lord Dean of Guild complimented the civil engineer and stated that he thought the plans were admirable. It may be added that the executive are trying to arrange that several typical American locomotives will be exhibited alongside engines of British build, and that if possible several runs will be made between Edinburgh and London with these locomotives to test the relative efficiency of British and American engines on British railroads. The results will doubtless be very interesting. This shows the desire of the executive to produce something distinctly new. Mr. W. A. Bryson, a member of the Institute of Electrical Engineers, has been appointed engineer and electrician, and his connection with the Glasgow and other exhibitions gives a guarantee that, so far as his efforts are concerned, the exhibition will be a success. Arrangements have been made for forwarding to Edinburgh exhibits at the Paris Exposition from Russia, Italy, Austria, China and the East Indies.

The Market for Gas Securities.

The city market for gas shares is dull and uneven, although no great change in prices is reported. The scale, however, was downward. Consolidated sold down to 93, and some transfers were made at a shade below that figure. To-day (Friday) it is bid for at 93¼. As this is virtually dividend on, the stock is shown to be worth, in the opinion of investors, say, 91. Equitable is steady and firmly held, which is not to be wondered at when the increased rate of business that it enjoys is remembered. Mutual is also in better demand, and there is even some inquiry for Standard common. Looking carefully over the situation we can truthfu ly say that city gas shares were never in more stable position than they are to-day. Brooklyn stocks show no marked change in quotations, but the undertone there is decidedly better. Chicago Trusts are at 54½, and Baltimore Consolidated has moved up to 44½. Laclede new common is quoted at 22½. We understand that Bay State (Boston) common was offered this week in Boston at 19.

If anyone wishes to dispose of 50 shares at that figure we can find a purchaser for the same. In the meantime all talk to the effect that Bay State will pay a dividend next January is simply bosh. The effort by the Bay State syndicate to purchase the Waltham (Mass.) Company has been renewed.

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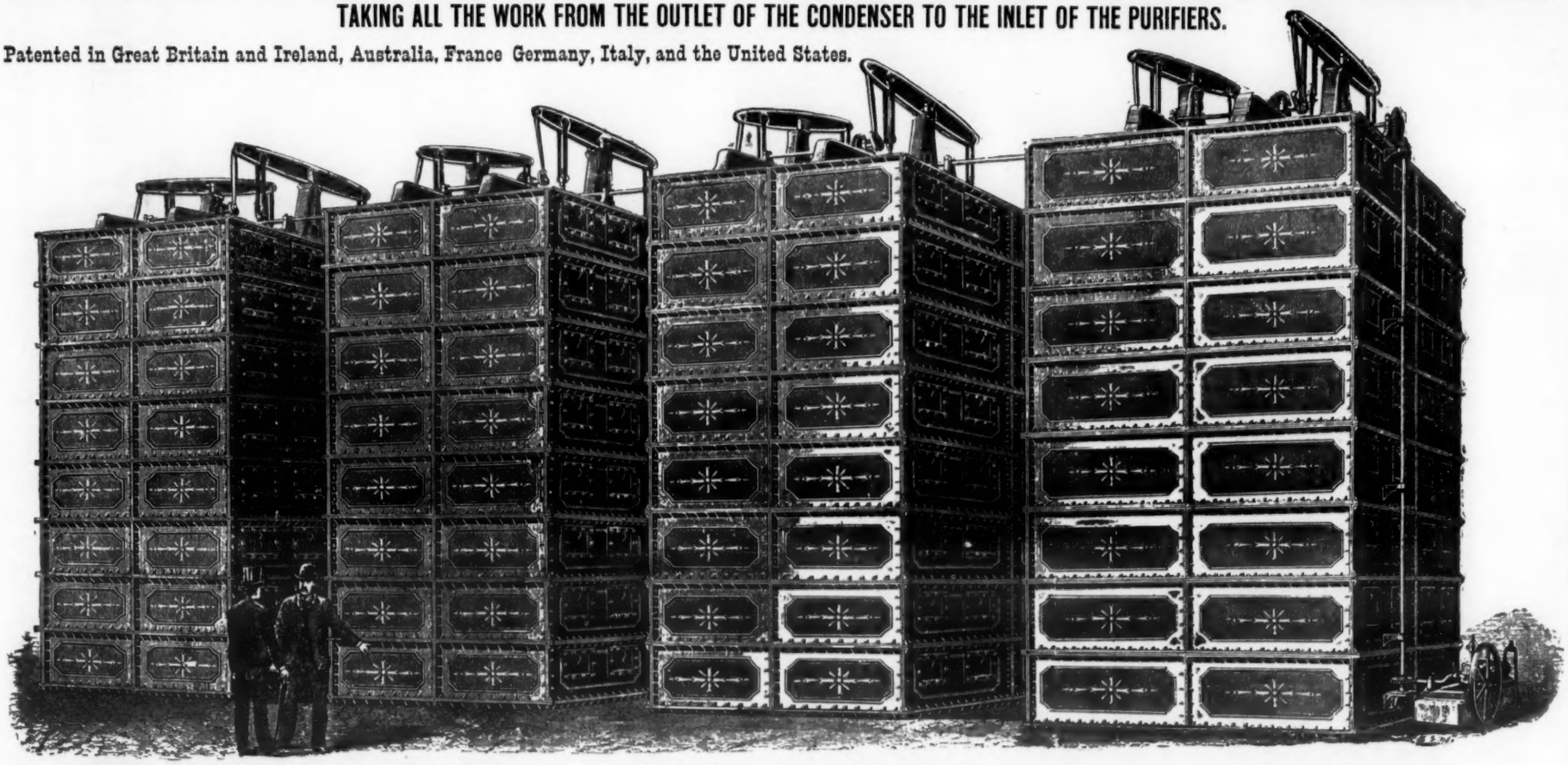

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The Machine is the most important improvement effected in gas works for years past. The purifying power developed is most remarkable. We send an Engineer with a working model to any Gas Company inviting information. It is equally adapted to gas works of any size.

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The gas enters into the washing chamber at the lowermost part, where it is first subjected to a thorough washing in the strong Ammoniacal Liquor. The washing is most effective. The entire surface of the Ammoniacal Liquor is in a bubbling state of ebullition, presenting an agitated, frothy surface all over. All the Tar left in the gas after surface condensation is here completely extracted, and a large amount of Carbonic Acid.

The gas, thus so far purified, ascends from the washing chamber and passes from one superposed chamber to another in contact with the enormous amount of movable, constantly dipping wetted surfaces, leaving the uppermost chamber entirely purified from Ammonia, meeting the chemical requirements of the Board of Trade.

The Machine is self-cleansing, and can never choke or stop up; and in this important respect it is superior to all Machines heretofore known. The space occupied by the Machine is very small. In most cases it can be placed in the space inside the end of the Purifying House. Its cost is less than any other known apparatus for purifying gas from Tar and Ammonia.

These Machines are at work and in hand for Widnes, Burnley, and Oswaldtwistle, in Lancashire; at Harrogate and Wakefield, in Yorkshire; at Stalybridge, in Cheshire; at Stone, in Staffordshire; also at Cheltenham and Northampton, also at Melbourne, in Australia.

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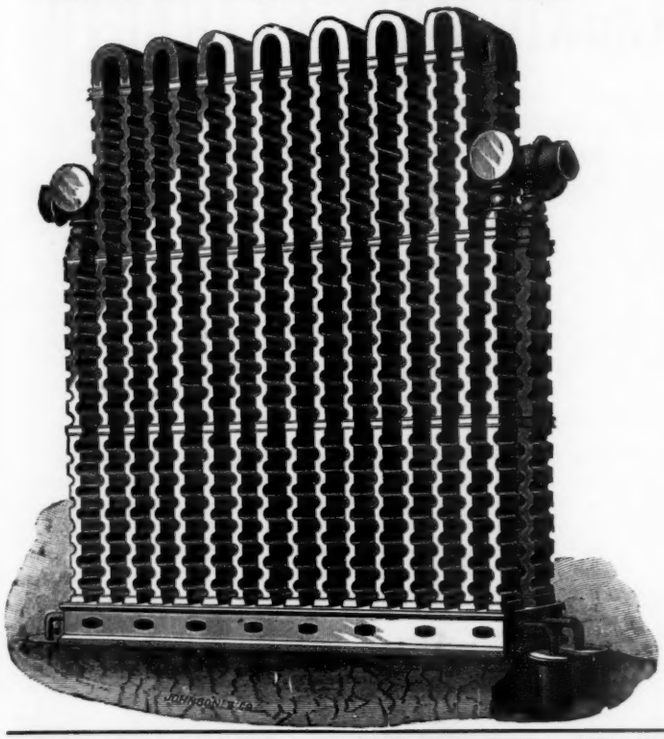

We desire to draw the attention of the gas community to the merits of the SINUOUS FRICTION CONDENSER. Companies intending to introduce new condensers into their works will do well to confer with us and examine plans and estimates before contracting for any other pattern The FRICTION CONDENSER is now in use at the gas works located in the following places:

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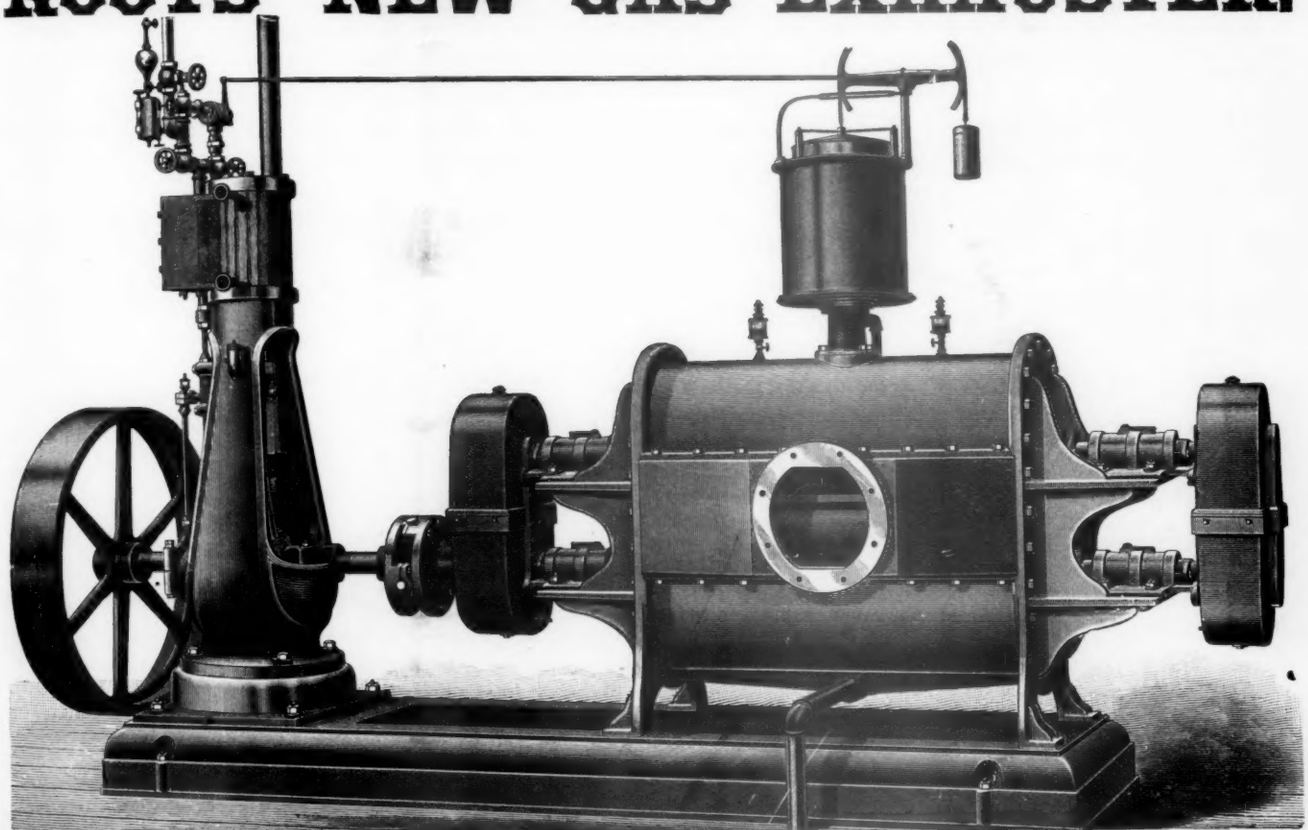

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A very general demand exists, in both large and small Gas Works, for an apparatus that will be absolutely efficient in the removal of the tar which passes the hydraulic main and condenser. Many attempts have been made to accomplish this, but, I believe, without success, until the introduction, five years ago, in England, of the C. & W. Walker Patent Tar and Carbonic Acid Extractor. During these years this apparatus has been adopted by many of the most prominent Engineers, not only in England, but also on the Continent of Europe and in other parts of the world. It is only necessary to give here a partial list in order to convince any intelligent American Gas Engineer that this machine must have succeeded fully in accomplishing the desired results.

The following Engineers have personally given permission to refer to them:

G. C. Trewby, Esq., Engineer-in-Chief of the Gas Light and Coke Co., London. The manufacturing plant at Beckton is built in complete sections of 3,000,000 cubic feet capacity each. A Walker Tar Extractor has been fitted to each one of these sections. This was done after a long and thorough trial on one of its sections. The Tar Extractor has been supplied to other works of the Gas Light and Coke Co., including those of which John Methven, Engineer of the Gas Light and Coke Co. at the Nine Elms Station, is in charge. Also to G. E. Stevenson, Peterborough Gas Works; B. Green, Mitcham and Wimbledon Gas Works; W. H. Smith, Bedford Gas Works; F. Linging, Norwich Gas Works; J. T. Browning, Colchester Gas Works; S. B. Darwin, Portsmouth Gas Works; J. McCrae, Dundee Gas Works; W. J. Wells, Stamford Gas Works; J. M. Darwin, Longton Gas Works; J. Paterson, Warrington Gas Works; and J. Coulter, of the Dundalk Gas Works. All of the foregoing gas works are located in Great Britain.

Mr. Charles A. Gerdenier, Superintendent of the Bridgeport (Conn.) Gas Light Company, writes as follows, under date of Dec. 3, 1887:

"The C. & W. Walker Tar and Carbonic Acid Extractor has been in operation at these works for the past six weeks, and is an unqualified success. It removes every particle of Tar from the gas in once passing through the apparatus, and a large percentage of the Carbonic Acid. I also feel quite sure that it prevents the formation and deposit of Naphthaline, because since I started the Washer I have had no stoppages from this cause. These works have been seriously troubled with Tar for many years, and I have used several kinds of apparatus and every expedient which has come to my attention for dealing with the difficulty, but without success. The Walker apparatus occupies comparatively small space, is less expensive than other systems, and requires but little attention. I carry 2½-inch seal, and have an automatic tar delivery valve. This Tar Extractor is indispensable to gas makers."

I have taken the Agency for the United States for this apparatus, and am now prepared to make contracts to erect it on the premises of any Gas Company. It would be manufactured in the following sizes:

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No. 2,	"	"	125,000	"	"	"	4	"	"	" "
No. 3,	"	"	250,000	"	"	"	5	"	"	" "
No. 4,	"	"	500,000	"	"	"	6	"	"	" "
No. 5,	"	"	750,000	"	"	"	7	"	"	" "
No. 6,	"	"	1,000,000	"	"	"	8	"	"	" "
No. 7,	"	"	1,250,000	"	"	"	9	"	"	" "
No. 8,	"	"	1,500,000	"	"	"	10	"	"	" "
No. 9,	"	"	2,000,000	"	"	"	12	"	"	" "
No. 10,	"	"	3,000,000	"	"	"	15	"	"	" "

This Tar Extractor will perform its work with about one-fourth the usual back-pressure heretofore required. It is simple in construction, and can be supplied at a very reasonable price—less than any other ever before introduced. Satisfactory results will be guaranteed in every instance.

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Sheboygan National Gas Co.	Sheboygan, Wis.
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Mankato Gas Light Co.	Mankato, Minn.
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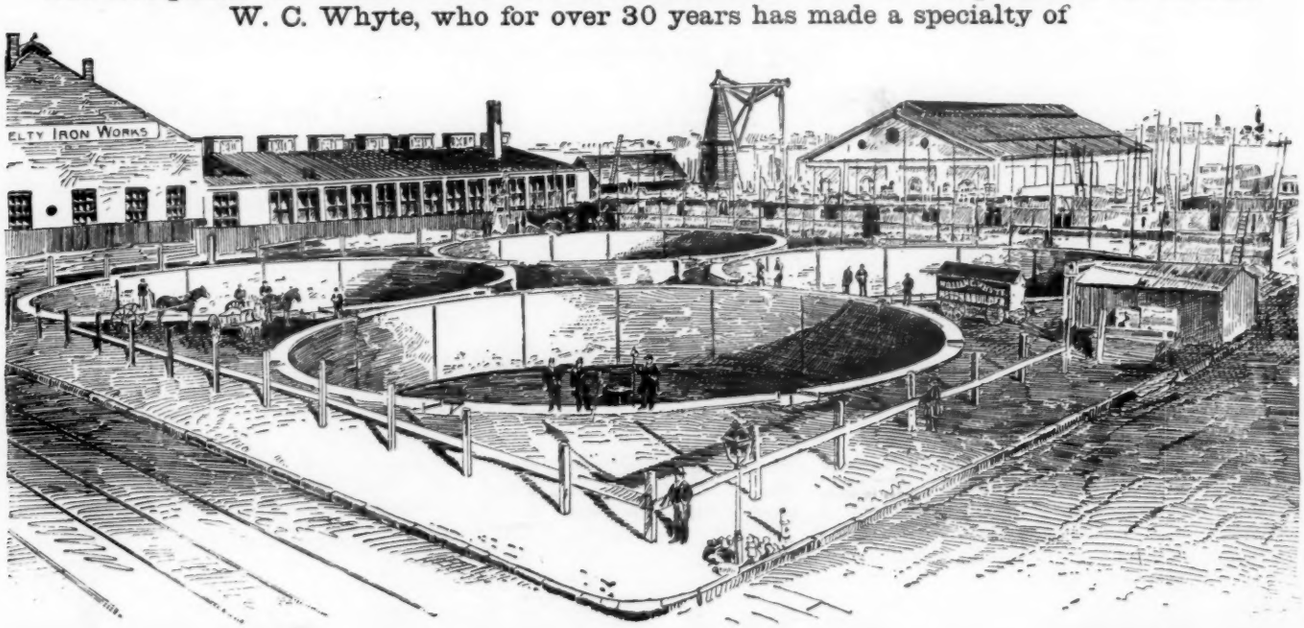

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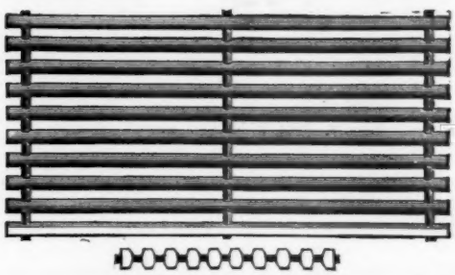

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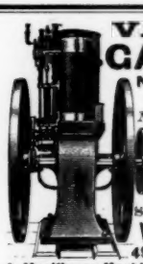

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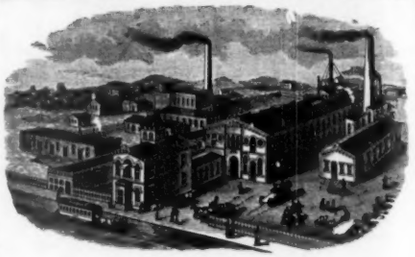

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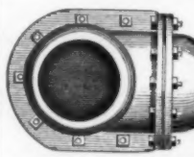

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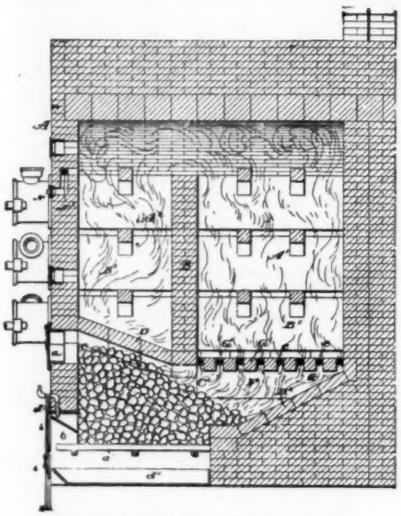

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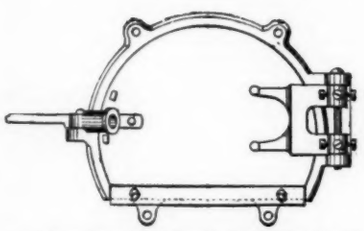

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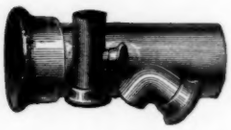

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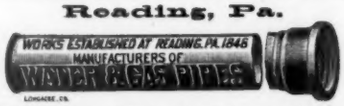

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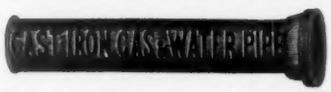

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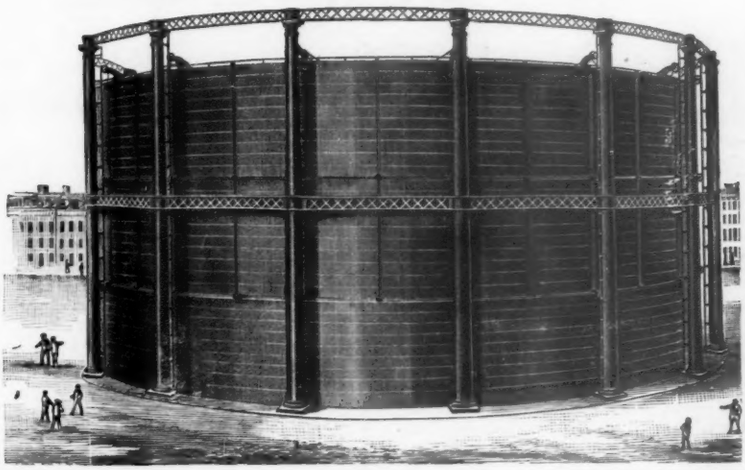

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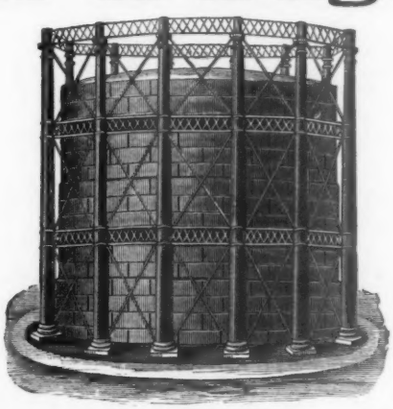

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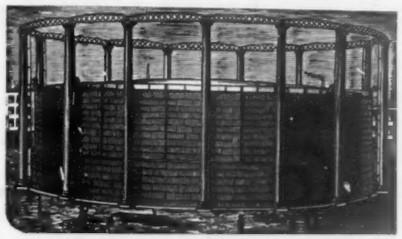
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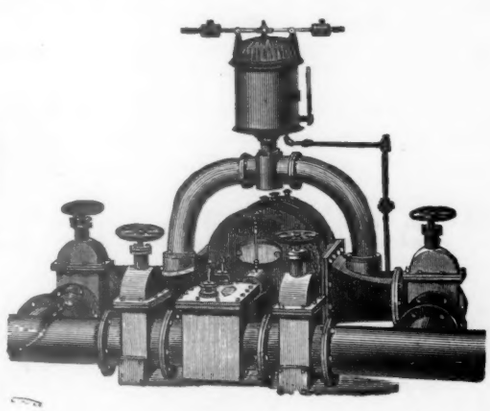

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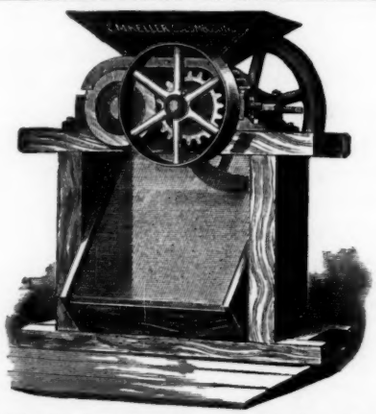

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